

**THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:**

1. A method for generating a shared secret value between entities (A,B) in a data communication system, one or more of said entities having a plurality of members ( $A_i$ ,  $B_i$ ) for participation in said communication system, each member having a long term private key and a corresponding long term public key said method comprising the steps of:
- (a) generating an entity long term private key and corresponding entity long term public key for each entity by combining the long term private and public keys of each members of the entity.
  - (b) generating a short term private and a corresponding short term public key for each of the members;
  - (c) exchanging short term public keys of the members within an entity;
  - (d) for each member:
    - i. computing an intra-entity shared key by mathematically combining said short term public keys of each said member;
    - ii. computing an intra-entity public key by mathematically combining its short-term private key, the long term private key and said intra-entity shared key;
  - (e) for each entity combining intra-entity public keys to derive a group short-term public key;
  - (f) each entity transmitting its intra-entity shared key and its group short term public key to said other entities; and
  - (g) each entity computing a common shared key K by combining its group short term public key, with the intra-entity shared key, and an entity long term public key received from the other entity.
2. A method as defined in claim 1, said long term public key being derived from a generator point P and respective ones of said long term private keys.
3. A method as defined in claim 2, said step (a) including each member selecting a random integer  $x_i$  and multiplying said point P by  $a$  to obtain  $x_iP$ , the short term public key.

4. A method as defined in claim 3, said intra-entity-shared key being computed by summing said short term public keys.
5. A method as defined in claim 4, said intra-entity public key  $s_i$  being derived by computing  $s_i = x_i + a_i f(\sum x_i P)$ , where  $f$  is a hash function.
6. A method as defined in claim 5, said group short term public key being derived by computing  $\sum s_i$ .
7. A method as defined in claim 1, said long term public keys being derived from a generator  $g$  and respective ones of said long term private keys.
8. A method as defined in claim 7, said step (a) including the step of each member selecting a random integer  $(x_{ij})$  and exponentiating a function  $h(g)$  including said generator to a power  $g(x_{ij})$  to obtain the short term public key  $X_{ij} = h(g)^{g(x_{ij})}$ .
9. A method as defined in claim 8, said intra-entity shared key  $(X_i)$  being computed by each entity multiplying each of its short-term public keys  $X_{ij}$  together.
10. A method as defined in claim 1, including the step of exchanging the entity long term public key between entities.
11. A method as defined in claim 10, each entity computing a common shared key  $K$  by combining its group short term public key  $(S_i)$ , with the intra-entity shared key  $(\bar{X}_i)$ , and an entity long term public key received from the other entity.